# Site Need Statement

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| **General Reference Information** | |
| 1 * | ***Need Title*:** Anti-foaming Agents for Evaporation of Alkaline Wastes |
| 2 * | ***Need Code:*** RL-WT086 |
| 3 * | ***Need Summary*:** Evaluate additives that inhibit and/or reduce foaming of alkaline wastes during evaporation. |
| 4 * | ***Origination Date*:** FY 2001 (October 18, 2001) |
| 5 * | ***Need Type*:** |
| 6 | ***Operation Office*:** Office of River Protection |
| 7 | ***Geographic Site Name*:** Hanford Site |
| 8 * | ***Project*:** Waste Treatment and Immobilization Plant PBS No: RL-TW06 |
| 9 | ***National Priority:***<br>____1. High - Critical to the success of the EM program, and a solution is required to achieve the current planned cost and schedule.<br>____2. Medium - Provides substantial benefit to EM program projects (e.g., moderate to high life-cycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays).<br>__X__3. Low - Provides opportunities for significant, but lower cost savings or risk reduction, may reduce the uncertainty in EM program project success. |
| 10 | ***Operations Office Priority*:** |
| **Problem Description Information** | |
| 11 | ***Operations Office Program Description*:** To perform the activities necessary to remediate the Hanford tank waste, DOE assigned responsibility to the Office of River Protection (ORP) in Richland, Washington. DOE has extended a contract for the design, construction, and commissioning of a new Waste Treatment and Immobilization Plant (WTP) that will treat and immobilize the waste for ultimate disposal. The WTP is comprised of four major elements, pretreatment, LAW immobilization, HLW immobilization, and balance of plant facilities. |
| 12 | ***Need/Problem Description*:** The alkaline liquid fraction of the tank wastes contains varying quantities of aqueous soluble organic compounds such as oxalate, formate, citrate, EDTA, and HEDTA. Evaporation of these waste solutions can lead to foaming and increased entrainment of radionuclides and hazardous waste constituents into the evaporator overheads, causing the overheads to exceed waste acceptance criteria at effluent treatment facilities. Additionally, efforts to address foaming are likely to negatively impact process throughput. |
| 13 | ***Functional Performance Requirements*:** Efforts to address foaming must not negatively impact process throughput. Should defoamers be utilized, defoamer must be effective in the parts-per-million dose range, be easy to meter for use, and be safe for industrial type handling with a minimum of personnel protection needed. |
| 14 | ***Definition of Solution*:** |
| 15 * | ***Targeted Focus Area*:** Tanks Focus Area |
| 16 | ***Potential Benefits*:** Reduce risk that evaporator overheads exceed waste acceptance criteria at effluent treatment facilities. The major benefit of these facilities is to ensure that the WTP starts up and operates according to plan and schedule: processing the various wastes in the quantities expected. |
| 17 | ***Potential Cost Savings*:** |
| 18 | ***Potential Cost Savings Narrative*:** |
| 19 | ***Technical Basis*:** Antifoaming agents have been used extensively at the Hanford Site and Savannah River Site to inhibit foaming during the evaporation of alkaline tank waste solutions. However, the chemistry of these waste solutions is modified in the WTP due to the addition of recycle solutions from the vitrification off-gas treatment systems. |
| 20 | ***Cultural/Stakeholder Basis*:** The River Protection Project is committed to moving forward to design, construct, and put into operation the Waste Treatment and Immobilization Plant on the schedule recently agreed to in the Tri-Party Agreement. A robust program is necessary to ensure that delays, all of which are costly, are minimized. A key part of this risk mitigation is to include in the total program a capability to test with actual wastes the processes and equipment planned, or later in use. |
| 21 | ***Environment, Safety, and Health Basis*:** Failure to mitigate foaming could possibly impact the release |

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| | of constituents of concern into off-gas system. |
| 22 | ***Regulatory Drivers*:** Environmental Impact Statement (EIS) for the Tank Waste Remediation System (TWRS) (DOE-RL and Ecology 1996) and the Hanford Federal Facility Agreement and Consent Order (known as the Tri-Party Agreement) and its amendments. DOE has negotiated additions to the Tri-Party Agreement that require the retrieval of single shell tanks by 2018, and the startup and operation of the WTP to support the treatment and immobilization of tank waste. By operating the WTP not only is that capability demonstrated and about 10% by volume (25% by activity) of the tank waste processed, but space is made available in the double shell tanks to allow the single shell tank retrieval to proceed without the expenditure of vast sums for additional double shell tanks. Other regulatory drivers include gathering the data necessary for the regulatory permits required for the startup and operation of the facility. |
| 23 | ***Milestones*:**<br>November 15, 1999 tri-party agreement on principal regulatory commitments:<br>• Start (Hot) commissioning-Phase I Treatment Complex 12/2007<br>• Start Operation-Phase 1 Treatment Complex 12/2009<br>• Complete Phase I-Treatment (no less than 10% of the tank waste by volume and 25% of the tank waste by activity) 12/2018<br><br>Other selected TPA milestones are:<br>• Retrieve all SSTs 2018<br>• Close SSTs 2024<br>• Immobilize remaining tank waste 2028<br>• Close all tanks 2032 |
| 24 | ***Material Streams*:** Hanford High-Level Defense Waste. The River Protection Project (formerly known as the Tank Waste Remediation System) involves PBSs RL TW-01 through TW-09. The technical, work scope definition, and intersite dependency risks for Phase 1 Waste Treatment and Immobilization is respectively, 3,3,3 on a scale of 1 to 5 where "5" represents high programmatic risk. This stream is on the critical closure path for Hanford Site cleanup. |
| 25 | ***TSD System*:** Hanford Waste Treatment and Immobilization Plant. Technical risk is timely startup of this plant and its ability to operate at planned throughput (capacity and operating efficiency). |
| 26 | ***Major Contaminants*:** Fission products, actinides, and nitrate. |
| 27 | ***Contaminated Media*:** Tank waste consisting of supernate (liquid), salt cake, and sludge. |
| 28 | ***Volume/Size of Contaminated Media*:** The Hanford Site has 177 underground tanks that store 204 million liters (54 M gallons) of waste containing about 190 MCi of activity. |
| 29 * | ***Earliest Date Required*:** 11/2002 The earliest date required is in support of WTP permitting. |
| 30 * | ***Latest Date Required*:** 11/2009 Support Hot Commissioning (which must be completed in 12/2007) and subsequent operation leading to Commercial Operation (which must be started by 12/2009). |
| **Baseline Technology Information** | |
| 31 | ***Baseline Technology/Process*:** |
| 32 | ***Life-Cycle Cost Using Baseline*:** The current baseline for the WTP is several billion dollars, with the BNI estimate itself in the $4 billion range. The current River Protection Project (formerly known as Tank Waste Remediation Systems) life cycle costs are estimated at approximately $50 billion. |
| 33 | ***Uncertainty on Baseline Life-Cycle Cost*:** There is large uncertainty in the WTP life-cycle cost, providing the opportunity to reduce the life-cycle cost due to operation improvements as well as ensuring operational success not to add additional cost to the system. |
| 34 | ***Completion Date Using Baseline:*** Currently there is large uncertainty in the WTP life-cycle cost, and it will be revised after the new Design and Construction contractor is put under contract early in FY2001. |
| **Points of Contact (POC)** | |
| 35 | ***Contractor End User POCs*:**<br>Paul Rutland, River Protection Project – Waste Treatment Plant, Process Technology Flowsheet, P/509-371-5213; F/509-371-5163; email: plrutlan@bechtel.com<br>Reid Peterson, River Protection Project – Waste Treatment Plant, Research and Technology – Pretreatment Technology, P/509-371-5128, F/509-371-5163, email: rpeterso@bechtel.com |
| 36 | ***DOE End User POCs*:**<br>N R. (Rudy) Carreon, DOE Office of River Protection Project Requirements Division, 509-373-7771, |

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| 37 * | ***Other Contacts:*** |

*Element of a Site Need Statement appearing in IPABS-IS